

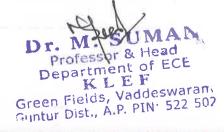
Koneru Lakshmaiah Education Foundation (Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

Accredited by NAAC as 'A++' ◆Approved by AICTE ❖ ISO 21001:2018 Certified Campus: Green Fields, Vaddeswaram - 522 302, Guntur District, Andhra Pradesh, INDIA. Phone No. +91 8645 - 350 200; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in Admin Off: 29-36-38, Museum Road, Governorpet, Vijayawada - 520 002. Ph: +91 - 866 - 3500122, 2576129

Department of Electronics and Communication Engineering

Program: B.Tech -ECE Academic Year: 2020-21

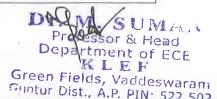
COURSE CODE	COURSE NAME	CO NO.	CO DESCRIPTION
no film	Integrated Professional	CO1	Understand the concepts of grammar to improve communication, reading, and writing skills
		CO2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.
20UC1101	English	CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices
		CO4	Apply the concepts of writing to draft corporate letters, emails and memos
	English Proficiency	CO1	Demonstrating different interpersonal skills for employability
001101000		CO2	Distinguishing Business essential skills
20UC1202		CO3	Classifying social media and corporate communication skills.
		CO4	Applying analytical thinking skills
20UC2103	Professional Communication Skills	CO1	Able to spot the common grammatical errors related to sentence structure, preposition, concord, relative and conditional clauses and parallel structures. The learner should be efficient to construct a context-determined text in addition to learning Technical Writing Skills.
		CO2	Able to read, understand, and interpret a text intrinsically as well as extrinsically. The learner can browse a text quickly to come-up with a gist and personal interpretation. Able to create a healthy work-environment and prove to be an asset or one of the most reliable resources to the organization.
		CO3	Apply the concepts of time and work; mentime-work problems based on wages, pipes and cisterns. Apply the concepts of time and distance and solve the problems related to average speed, relative speed.



		CO4	Apply Venn diagrams to find out appropriate conclusions from the given statements. Apply the logical implications and also the negations of various connectives to find the solutions. Analyze the data and represent in the form of Venn diagrams to find relations between any given set of elements.
		CO1	Verbal ability
2011/22204	Corporate	CO2	Soft skills
20UC2204	Communication Skills	CO3	Quantitative aptitude
		CO4	Reasoning
- a .	LOUBESCHAPTION	CO1	Apply the strategies and techniques for conversations in different contexts. Analyze the different parameters and formats of written technical communication and apply in everyday work and life.
201152005	har an estate of the comment	CO2	Analyze the concepts of critical and analytical reading skills. Apply the strategies and techniques learnt in handling interviews in different contexts.
20UC3005	Aptitude Builder I	CO3	Apply the concepts of Ratio & Proportion, Percentages, Profit &Loss, Simple & Compound Interest
	in contempts of vertice in the summer well record to the summer of the sent to the reservent to the summer because the summer sum	اللتارات	Analyze the series of numbers or letters to predict the next number in the series or to find the analogy. Analyze the data to find the codes in the process of encoding and decoding. Apply the given set of conditions to select a team from a group of members.
		CO1	Apply the strategies and techniques for conversations in different contexts. Analyze the different parameters and formats of written technical communication and apply in everyday work and life.
20UC3006	the second or many days and	CO2	Analyze the concepts of critical and analytical reading skills. Apply the strategies and techniques learnt in handling interviews in different contexts.
20003000	Aptitude Builder II	CO3	Apply the concepts of Ratio & Proportion, Percentages, Profit &Loss, Simple & Compound Interest
		CO4	Analyze the series of numbers or letters to predict the next number in the series or to find the analogy. Analyze the data to find the codes in the process of encoding and decoding. Apply the given set of conditions to select a team from a group of members.
	*Indian Heritage and	CO1	To familiarize with various aspects of the culture and heritage of India through ages.
	Culture	CO2	To acquaint with the contributions of Indians in the areas of languages and literature, religion and philosophy

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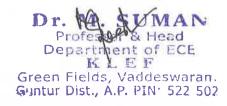
		CO3	To understand the Social structure and the spread of Indian culture abroad
	n har man a managan ana	CO4	To know the development of Science and Technology in India through ages and to appreciate the contributions of some of the great Indian scientists
		CO1	To understand Constitutional development after Independence
201100000		CO2	To learn the fundamental features of the Indian Constitution
20UC0008	*Indian Constitution	CO3	To get a brief idea of the powers and functions of Union and State Governments
	Language of the second state of	CO4	To understand the basics of working of Indian Judiciary and the Election Commission
		CO1	Understand the importance of Environmental education and conservation of natural resources
20UC0009	*Ecology & Environment	CO2	Understand the importance of ecosystems and biodiversity.
	and policy to the light	CO3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.
T	*Universal Human Values & Professional Ethics (online)	CO1	Understand and identify the basic aspiration of human beings
20UC0010		CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.
		CO3	Analyze the profession and his role in this existence.
		CO1	Learn critical elements of entrepreneurship and its development from institution's perspective
		CO2	Understand the process of entrepreneurship and its eco system in an educational institute to fit is entrepreneurship zone
		CO3	Understand & Learn Design Thinking skills towards product innovation & prototype design
		CO4	Learn the essential component of planning a new startup, including a. Recognizing viable market opportunities & Market assessment via
	ں سے مصنوع نے براغاد میں اساس میں اساس کی سامان میں اساس کی ارتاب	5	Study the practices of working with Co-student in other discipline, integrating creative business strategies with solid engineering and effectively
		6	Recognize the methods of making decisions in highly uncertain and unstructured environments to take feedback from a large variety of sources that use it to improve their business plans, or help them to 'pivot' and find alternative ideas of



	Fall Hall dire	i la i	approaches
	D+ - 1 - 111 1 - 1 11		
	and the state of the		
		throught.	Apply matrix algebra to the real-world
		CO1	applications in engineering, physical and
			biological sciences, computer science, finance,
	6 6 H	7 1 7	economics and solving the system of equations.
	30 II H 11	4.17	Apply basic and computational techniques on
	hu sand but	CO2	discrete structures like relations, orders,
	Mathematics for		functions & FSM, Lattices, and propositional &predicate logic
20MT1101	Computing	. Titler	Apply graph theory to solving real world
		CO3	structures and their related applications.
	- '' 1 (- 11' 11'		Apply Statistical methods to solving the real-
	the state of the s	CO4	world applications in Engineering science,
	()	المساوي	Economics and Management.
		=/111110	Apply basic concepts of Aptitude and
	1.5	5	Reasoning to solve engineering and real world
	A DESTRUCTION OF THE	1 2015	problems (Tests in skilling hours)
	and the second control of	CO1	Apply differential and integral calucullus to find
		Jan 1911	maxima and minimum of a functionctions. Demonistrate the forier series and Laplace
	et did du agranda arti	CO2	transforms.
19MT2102	Mathematics for	er virging ag	Describe the probability, randam variables and
	Engineers	CO3	Distributions
		n vi ii iz i	Explain the complex variables analytic
	The section is seen and in the second	CO4	functionsstochastic process and algebric
	manual trade (Carrier of Carrier)	a color in	structures
	nouthing to estimate in the pro-	CO1	Acquire the Knowledge of basic biology
19BT1001	Biology for Engineers	CO2	Acquire the Knowledge of Human Biological
13011001	Blology for Engineers	uj e nbete	Systems
	er og Ser in dinkrimen	CO3	Acquire Knowledge on Microorganisms and Biosensors
		001	Understand the basics of design thinking and its
	kesan radi manda ini qu	CO1	implications in product or service development
	Andrew Sames Interior	CO2	Understand and Analyse the requirements of a
20UC1102	Design Thinking and	CO2	typical problem
	Innovation I	CO3	Plan the necessary activities towards solving the
	the staff and the staff of	CHIAN.	problem through ideation and prototyping
	to dead sittle misor in Science (CO4	evaluate the solution and refine them based on the customer feedback
	Family South of Time Internation St		Understand the basics of design thinking and its
	may an action of the same	CO1	implications in product or service development
201101000	Design Thinking and	000	Understand and Analyse the requirements of a
20UC1203	Innovation Ii	CO2	typical problem
	In untransación lungados	004	evaluate the solution and refine them based on
	بعاد المالية بالإسالية العالم	CO4	the customer feedback
SCIE	NCE ELECTIVE-1	a Bl., M	
111111111111111111111111111111111111111	A international parameters	CO1	Ability to understand classification of solids
19PH1008	Physics for Electronic Engineers	COI	based on their Energy Bands.
		CO2	Ability to understand the conducting and
		772	semiconducting properties of solids at the

		7.70	microscopic level.
		CO3	Ability to understand the dielectric properties of materials at the microscopic level and their applications.
		CO4	Ability to understand the magnetic interactions in materials and the applications.
Z-m-1		5	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects
		CO1	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.
19 PH1004	Solid State Physics	CO2	Understands role of molecular level vibrations in determining thermal properties of materials, heat treatment methods for changing the microstructure of materials and micro and macro level responses of materials subjected to load, for identification of materials having specific engineering applications.
in in the		CO3	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.
	CO4	Understands the role of electronic energy band structures of solids using various models, classification of materials based on their band structures and their properties	
		514	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects.
	*	CO1	Understand the need of Quantum Mechanics and mathematical formulations of equations.
100110101	Quantum Mechanics for	CO2	Understand the Wave function and its Physical properties.
19PH2101	Engineers	CO3	Understand the applications of Quantum Mechanics for some semiconducting components.
		CO4	Understand some simple Quantum Systems
SCIEN	CE ELECTIVE-2	LX ry	Supplied to the supplied to th
	- 17	CO1	Demonstrate different types of semiconducting materials
		CO2	llustrate photophysical basis of light absorption and emission by materials
19CY1101	Engineering Chemistry	CO3	Sketch the underlying principles of organic light emitting diodes
		CO4	Explain the concepts of solar cells modules and memory devices
	2	5	An ability to apply and generate experimental skills
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		CO1	Develop the current knowledge of materials and apply the characteristics, theories of materials in biomedical applications.
		CO2	Interpret the interaction of biomolecules with various bioelectrodes and host responses to implants, including toxicity and health implications
19CY1002	Chemistry and Bio- Informatics for Engineers	CO3	Relate genetics and modern DNA technology for disease diagnostics, therapy and drug design.
		CO4	Illustrate the application of chemistry, organic electronics in diagnostic and therapeutic area.
		5	Analyse the properties of the samples using analytical instruments which are useful for clinical analysis in health care, drugs and pharmaceutical laboratories.
		CO1	Demonstrate different types of semiconducting materials
		CO2	Illustrate photophysical basis of light absorption and emission by materials
19CY1004	Organic Electronics	CO3	Sketch the underlying principles of organic light emitting diodes
		CO1	Explain the concepts of solar cells modules and memory devices
		CO2	An ability to apply and generate experimental skills
ENGINEEL	RING SCIENCES	0.77 0	
		CO1	Design basic and complex building blocks for real world problems using structured programming paradigm
		CO2	Apply computtaional thinking into logic design for solving real world problems
20SC1101	Computational Thinking for Design	CO3	Apply CRUD operations on basic data structures
	101 2 101 21	CO4	Apply CRUD operations on linear data structures
		5	Apply the structured programming paradigm with logic building skills on basic and linear data structures for solving real world problems
20SC1202		CO1	Apply measures of efficiency on algorithms and Analyse different Sorting Algorithms.
	Data Structures	CO2	Analyse and compare stack ADT and queue ADT implementations using linked list and applications.
		CO3	Analyse the linked implementation of Binary, Balanced Trees and different Hashing techniques.
		CO4	Analyse different representations, traversals, applications of Graphs and Heap organization.
		5	Develop and Evaluate common practical applications for linear and non-linear data structures.



		CO1	Design a product using 3D modeling in Auto Desk Fusion 360 through the concept of Engineering Design Process.
	Design Tools Workshop -	CO2	Design of static webpages using HTML5 and CSS.
20ME1103	I	CO3	Apply the concepts of Latex in writing the reports.
		CO4	Apply visualization techniques in creating data visualization dashboards with tools like Power BI.
		CO1	Demonstrate the design ideology by 3D printing, 3D scanning techniques
19SC1209	Design Tools Workshop -	CO2	Illustrate the design ideology by incorporating VR technique and VR technology, Visualize and present his design idea by applying AR technique and Hologram
		CO3	Summarizing PCB technology and their applications
		CO4	Demonstrate Arduino based skill with different interfaces
11		CO1	Understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language. Apply constructors, Overloading, parameter passing.
	Object Oriented Programming	CO2	Apply access control, Inheritance, Packages.
20SC1203		CO3	Apply Interfaces, Exception Handling, multi- threading, I/o
		CO4	Apply collection framework and event driven programming.
	1 / 1 / 1	5	Apply object-oriented programming concepts to write programs and Analyses requirements and design to implement lab-based project with SDLC in a group of students.
1		CO1	Understand the structure of a digital computer and design combinational circuits for processor using the principles of Boolean Algebra and gates
	- 1 1 in 2	CO2	Analyze the operation of latch/flip-flop and design timing and sequence control circuits using flip-flop
20EC1101	Digital Logic & Processors	CO3	Apply the programmable logic and design digital circuits using Programmable logic devices
		CO4	Apply the minimization techniques and Construct optimized combinational and sequential logic circuits
		5	Design of combinational and sequential circuits with logic gates and flip-flops with a verification using Logisim and Verilog HDL tool
19EC1202	Computer Organization & Architecture	CO1	Apply the concepts of logical modules in the design of CPU,control unit and registers

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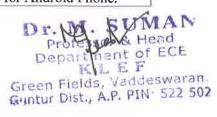
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		CO2	Analy the operations of Main memory,cache memory and virtual memory
		CO3	Infer the different I/o subsystems and various I/O transfer techniques
		CO4	Analyse the design issues of RISC and CISC CPUs and the pipeline architectures.
		CO1	Analyze the V-I relations of different passive circuit elements
20EC1213	Design of Basic	CO2	Apply different circuit analysis techniques on practical circuits.
20EC1213	Electronics and Circuits	CO3	Analyze the V-I relations of different active circuit elements.
		CO4	Identify the practical circuits comprising semi conductor devices.
		CO1	Analyse the Analog and Digital electronic systems and their impacts on the performance
		CO2	Design PCB art -work by following PCB design rules using the Software and learning about fabrications, packaging and EMI/EMC issues
20EC2111	Electronic System Design Workshop	CO3	Apply the Raspberry Pi microcontroller to design an embedded system for modern electronic system design
20EC2111		CO4	Analyse the Electronic Circuits for the noise reduction designs in components and circuits, high frequency designs and CAD packages
		5	Design the different Electronic Circuits and Develop with PCB FABRICATION techniques and also design an embedded system using raspberry Pi to demonstrate for social problems.
		CO1	Demonstration of various Sensors both Analog & Digital for IoT Applications
		CO2	Applying & Interfacing various micro controllers with IoT: Micro controllers boards, ESP8266, Peripherals (Motors, Camera, Speaker, Displays), Controlling through Mobile & Web
20EC2214	IoT Workshop	CO3	Analyze different protocols with IoT Data Communication: Wi-Fi Protocols, Bluetooth, BLE, WSN, Zigbee, RFID, NFC, Client Server, Cloud.
		CO4	Examine the various Protocols & Case Studies: Issues & Challenges: Security, Privacy, Scalability, Store and Analytics Case Studies: Health, Smart cities, Village/ Agriculture
		5	Design and develop various mini projects using Node MCU, ESP 32 and Raspberry Pi for various applications.
20EC2112 IT Worksho	IT Washahas	CO1	Apply the knowledge of HTML coding for designing the web page
	11 Wolkshop	CO2	Apply the basic concepts of Arduino Interfacing to develope Native apps for Android Phone.



	iii ii e	CO3	Apply the concepts of interfacing the Raspberry Pi board with Web-App, and develop similar
	H = mile	CO4	applications for Mobile App Develop a Project using Raspberry pi for Web Apps or Mobile Apps
	1111	5	Design the projects based on HTML, XML, and Arduino Uno Boards.
PROFESSIO	ONAL CORE COURSES		
		CO1	Analyze the operation of electronic devices like transistors and illustrate their electronic behaviour using Multisim.
	ras nen	CO2	Distinguish linear and nonlinear circuits using lumped elements and analyze their response using Multisim
19EC2103	Analog Electronic Circuit Design	CO3	Interpret feedback in amplifiers and realize them through lumped element circuits and linear ICs
		CO4	Design various electronic circuits using linear ICs and demonstrate their applications using Multisim
	H 11 > 1	5	Design Analog circuits for realistic applications and demonstrate it through a mini-project
	String in the st	CO1	To Interpret and analyse different types of signals and perform various operations on them.
	in the second se	CO2	To make use of transforms in the analysis of signals and systems.
19EC2104	Communication Signals & System Design	CO3	To utilize properties and operations of signals for analysing the effects in the various communication systems.
	H I I I	CO4	To develop the foundation of signal processing for communication and analyse with system design.
,U -b		CO1	Apply time and frequency analysis techniques to Analog modulation systems.
		CO2	Analyze different digital modulation techniques.
19EC2105	Analog and Digital	CO3	Analyze digital carrier, signaling techniques with baud rate considerations.
1,202100	Communication	CO4	Analyze different switching techniques and real time signalling systems.
	De I	5	Design and analyze analog and digital communication circuits through project based learning using modern tools.
			Apply knowledge and demonstrate
Embedded Controllers & Embedded Systems Design		CO1	programming proficiency using the various addressing modes and data transfer instructions of 8086 microprocessor & 8051
	Embedded Controllers &		of 8086 microprocessor & 8051 Microcontroller.
	CO2	Analyze the Interfacing of Peripherals to the 8051 Microcontroller through programming & Apply the basic architectures of PIC and ATMEGA 32 Microcontrollers.	
		CO3	Apply the concepts of ARM - CORTEX STM- 32 Microcontroller and RTOS

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		CO4	Apply the concepts of SoC and Modern Microcontroller Boards key Features, Specifications & Applications.
		5	Analyze the applications of programming with 8051, 8086 and Arduino on hardware / software.
		CO1	Apply the principles of vector calculus and static feilds to estimate the static electric feilds and magnetic feild due to different sources
19EC2207	Electromagnetic Fields & Applications	CO2	Develop the boundary conditions on E, H Feilds and extend the concepts to obtain the governing laws of electromagnetic feild that helps to percieve the wave propagation
		CO3	Analysis of different electromagnetic feild applications
		CO4	Analyse different advanced electromagnetic feild applications
	E TO STATE OF THE	CO1	Develop DFT and apply that to analyze signals in the frequency domain
		CO2	Construct IIR filters for filtering operation
19EC2208	Digital Signal Processing	CO3	Construct FIR filters and find solutions for filtering problems
		CO4	Analyse the multi-rate signal processing concepts
		5	Develop signal processing algorithems in software and apply them to finding solutions to real time problems
	Statistics, AI, ANN	CO1	Apply the concepts of probability and distributions to analyze engineering problems.
20EC2209		CO2	Discover the relationship between statistics and machine learning and illustarte their usefulness in AI.
A		CO3	Categorize the various searching techniques and employ them for finding optimal solutions to Alproblems.
		CO4	Examine the neural network based models and test their learning capabilities in classification tasks.
		CO1	Describe the basics of Probability, statistics and apply them in engineering applications.
	AL ANNI Trade 6	CO2	Analyze the AI applications and identify the usefulness in real world problem solving.
20EC2209	AI, ANN Tools & Applications	CO3	Formulate the concepts of AI searching techniques and ANN models to solve basic problems.
	401	CO4	Develope and synthesize AI and ANN Models for real timeapplications.
		CO1	Interpret the basic network structure, software and models, device and applications
19EC2210	Data Networks and Protocols	CO2	Analyse the error detection and correction techniques in link layer protocols with cisco packet tracer
	The state of the s	CO3	Design and analyse different routing algorithms

			and netowrk layer protocols
		CO4	Design and analyse transport and application layer protocols
	11 < 11	5	Design of different netowrking protocols using simualtion
FLEXI CO	URSES		
	I	CO1	Apply the voltage biasing techineques to analyze MOS charecteristics
		CO2	Analyze the Pull up -pull down scaling ratios for MOS inverters
19EC3015	VLSI Design	CO3	Build MOS logic circuits using design rules
		CO4	Examine MOS circuit performance and faults using testing principles
	= ili ru= =	5	Develop MOS circuits and logic testing techniques
	i i i i i i i i i i i i i i i i i i i	CO1	Apply the wireless communciation concepts to interpret cellular architecture
		CO2	Analysis of different fadding mechanisims in mobile communications
	Wireless Communications	CO3	Analyze the equalization and diversity techniques in wireless communications
19EC3016		CO4	Analyze GSM architecture, frame format other wireless communication technologies such CDMA, IEEE 802.11, 4G and OFDM systems.
	5	Implement wireless fading channels and apply the concept of diversity and equalizer to evaluate signal reception performance in the presence of wireless channel using communication software tools	
	RF System Design	CO1	Apply smith chart to analyze the impedence measurement for various passive RF devices.
		CO2	Design and analyze RF filters
19EC3017		CO3	Design and analyze RF amplifiers and oscillators
		CO4	Analyse the design considerations of different real-time applications
		5	Design and analyze different RF amplifers, oscillators and other applications using HFSS
19EC3018	Biomedical Electronics & IOT for Healthcare	CO1	Apply the bio- signal characteristics, measure the electrical activity of heart, brain, muscles and determine the non electrical parameters.
		CO2	Demonstrate the working and significance of Medical Instruments in health care applications.
		CO3	Analyze various IOT sensors for Healthcare as a next generation boon for Electronics.
		CO4	Analyze the various IOT health care monitoring devices.
		5	Design, simulate and test bio signal characteristics and IoT applications for health care.

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		CO1	Demonstrate the characteristics of Electronics instruments and their Measurements and apply them to copute measurements.
nu I - I - I I	CO2	Explore the fundamental design concepts of Electronic Measuring Instruments and discover their usage in real time environment.	
19EC3019	Electronics Instruments & Automation	CO3	Describe the importance of Control Systems in Automation to construct a robotic systems with desired response.
		CO4	Analyze the industrial automation based applications and summarize their advantages in sustinable development.
		5	Synthesize various electronic instruments and control systems for automation.
	n elvi	CO1	Illustrate system design concepts and analyze their functionality.
	System Engineering,	CO2	Apply operational research methodology and solve linear programming problems.
19EC3020	Operation Research & Designing	CO3	Analyze finite queuing models and examine their applications in gaming theory.
		CO4	Analyze the design concepts in UI, UX and product design.
11	r — I — — ii — ii — ii — ii — ii	5115	Construct and combine operational research methodologies in systems engineering.
		CO1	Interpret the basics of electrical technologies of electrical circuits, motor and generators.
		CO2	Analyse the concepts of power generation transmission, and distribution on commercia systems and modern distribution systems.
19EC3021	Electrical Technologies & Solar Power Systems	CO3	Analyse the utilization of electrical smart grid on the existing electric grids using moder systems
		CO4	Apply the basic concepts of photovoltaic systems on the design of solar power system
		112121111 1-15	Design and development of electrical circuits power systems and analysis of sola photovoltaic systems
	01 di.pl	CO1	Describe the fundamentals of AI and interpret them for solving real world problems
7		CO2	Construct the machine learning techniques and demonstrate their use in pattern recognition.
19EC3022 Comp Fuzzy	Advance Course IN Soft-Computing (AI, ANN,	CO3	Formulate data dimensionality reduction problems and demonstrate their use for AI applications with large databases.
	Fuzzy Logic & Genetic Algorithms)	CO4	Recognize optimization and fuzziness in finding solutions to AI problems and demonstrate their approaches.
		5	Develop and synthesize AI concepts for classification, prediction, optimization and regression applications by generating performance analysis reports.
	ROFESSIONAL ELECTIV		T
20EC3051	Wireless sensor	CO1	Understanding of wireless sensor network

	Networks & IOT	100	technologies
	Applications	CO2	Study of BLE protocols in WSN security and power applications.
	N	CO3	Study and application of IOT and WSN for smart cities/ villages.
	7 =	CO4	Study of various IoT application in various domains
20EC3052		CO1	Apply the fundamentals, structure, and characteristics of photovoltaics to test the performance of the solar cell.
	Solar Photo-Voltaic cells & Solar Power Arrays	CO2	Analyze the SPV materials and production of SPV cells with different methodologies
		CO3	Apply design concepts and develop the reliable SPV with testing and optimization techniques.
		CO4	Analyse the SPV arrays, configurations with AI and ML.
		COI	Apply the concept of Renewable Energy with solar power and electronic power converters.
20EC3053	Electronic Systems for Renewable Energy &	CO2	Apply the electronics system concept for renewable energy sources with different sensors and data management.
201033	Smart Grid	CO3	Analyse the Concept of smart grid sub system and circuits
		CO4	Analyse Smart grid to IOT applications with smart grid security, communication and power system
	makan ale mite la ciant	CO1	Understand the basics of smart cities/villages/living
20002054	IOT Applications for	CO2	Study of systems for smart cities with case studies.
20EC3054	Smart Cities	CO3	Analysis and design of smart grid sub-systems and circuits
		CO4	Study of advanced topics related to privacy, scaling and design considerations.
20EC3055	Systems for Smart Cities & Smart Villages	CO1	Understanding the systems and smart systems with local requirements issues and solutions
		CO2	Study of System for smart villages with different modules of smart villages with privacy and security
		CO3	Study of System for smart cities with different management modules of smart cities.
	line 1-3	CO4	Understanding the next generation needs for smart Systems and Smart Global System.
VLSI		, XIII, III	
20EC3061	Low Power VLSI	CO1	Understand the power dissipation in MOS structure
		CO2	Illustrate probabilistic power analysis and apply low power techniques at circuit level for CMOS circuits
		CO3	Apply low power techniques for various combinational circuits.
		CO4	Design and analysis of low power techniques for memories.

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Algorithms for VLSI Design Automation CO2 Understanding of VLSI layout modeling CO3 Understand and analysis of hardware models CO4 Analysis and understanding the FPt technologies Study and design of combinational sequential circuits using PLDs and simachines. CO2 Design ASIC and FPGA Chip Design ASIC and FPGA Chip Design VLSI Sub-system Design and Design for Testability VLSI Sub-system Design and Design for Testability CO3 Design for Testability VLSI Sub-system Design and Design for Testability CO4 Design for Testability CO5 Design for Testability CO6 Design for Testability CO7 Design for Testability CO8 Design for Testability CO9 Design of testing of VLSI systems Demonstrate the basics of non-volatile memories and its applications CO9 Design of testing of VLSI systems Demonstrate the basics of solar cells and supercapacit to MEMS Devices Analysis the memory fault models and testing process CO9 Design of testing of VLSI systems Demonstrate the basics of solar cells and supercapacit to MEMS Devices Analysis the memory fault models and testing process CO9 Design of testing of VLSI systems Demonstrate the basics of solar cells and supercapacit to MEMS Devices Analysis the memory fault models and testing process CO4 Design of testing of VLSI systems Demonstrate the basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basics of solar cells and supercapacit (CO9) and few basi		e i r	CO1	Understanding of computational and automatic
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Analyze fundamental building blocks for automated system development and sho design parameters.
Interpret the design processes for building hon automation systems and formulate the entiend-to-end system configurations.
Analyze the methods developed for the efficie utilization of industrial robots and examine the effectiveness in various industrial domains.
Illustrate the application of robotics for huma assistance and show the parameters required for designing assistive technologies.
Apply Speech signal parameters to modal and classify distinguish Speech signal
Apply diversified Signal Processing approaches

Dr. MySUMAN

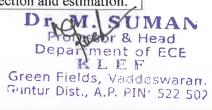
Professor & Head

Department of ECE

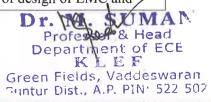
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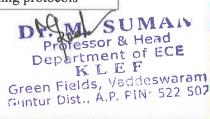
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		CO3	Apply and Analyze various signal processing approaches to represent various Speech signal
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Southwest	y neli i hi Tan yun uni su Haryi i u	CO1	Interpret the fundamental concepts of digital image processing and apply then to generate reviews on some key applications
igiz in	For the state of the second se	CO2	Develop 2D Transform models for analysing images in frequency domain and evaluate their capabilities.
20EC3082	Digital Image Processing	CO3	Develop restoration, segmentation and filtering algorithms on degraded images and list their efficiencies.
		CO4	Develop compression models and examine their performance for data transmission.
1	12 (14 per 15 20) 10 (6 Parts	5	Develope and modify various image processing algorithms.
and there	The state of the s	CO1	Describe imaging techniques applied to biomedical studies and summarize their usefulness in diagnostics.
20EC3083		CO2	Apply image processing mechanisms to derive features on biomedical images and discover performance metrics.
rame(t)	Analysis manual and a second an	CO3	Analyze the extracted features from biomedical images and categorize them with respect to usefulness in automation.
elr ingito	in to a survey cruis In to a survey splint with first In the a survey splint with di-	CO4	Discover important existing real time biomedical image analysis tools and explain their design processes.
was statesti ordinare	ov their importunes in under	CO1	Apply statistical signal models and their properties in the analysis of signals using Stochastic processes
20EC3084	Statistical Signal Processing	CO2	Design of optimum filters using classical and adaptive algorithms to extract the signals in the noisy environment.
= il sociality		CO3	Develop various spectral estimation techniques for achieving higher resolution in the estimation of power spectral density
e an initialization as an experience	ر الله بالحروب في من التا الله بالحروب في من التا	CO4	Analyze the Kalman and extended Kalman filters in the design of optimum filters
panta ap a	ent logista relativistica mita	CO1	Apply the fundamental concepts of adaptive systems and identify the critical design parameters.
20EC3085	Adaptive Signal Processing	CO2	Employ the Searching performance surface stability and rate of convergence parameters for describing adaptive systems.
	e with property in the property of	CO3	Apply the concepts of learning models and compare their performance in 1D domain.
ly all a	Lead Thomas Install Con-	CO4	Illustrate the applications of adaptive systems and categorize their design processes.
20EC3086	Detection and Estimation of Signals	CO1	Apply the fundamental directions in the design and analysis of signal detection and estimation.



	mes to minerate must	CO2	Employ statistical decision theoretical models and test their performance on multiple signal types.
		CO3	Analyze the algorithms in signal estimation and describe the properties of a signal estimatior.
		CO4	Describe the importance of state estimation in various applications and report the process flow models.
	, marco	CO1	Describe various sources of biosignals and identify their properties for signal analysis.
	Biomedical Signal	CO2	Analyze the signals obtained from bio instruments and apply signal processing methods to extract useful information.
20EC3087	Analysis	CO3	Review modern medical instruments and report their capabilities in enhancing health profiles.
	is image and the second	CO4	Apply advanced signal processing methods in improving the abilities of the existing models and test them.
RF AND MI	CROWAVE		
. n	alt mm ru' - m = m	CO1	Analysis of different microware components and devices
20502001	Microsiana Fa Sinceria	CO2	Apply S parameters and Analysis of differnt microware components
20EC3091	Microwave Engineering	CO3	Apply S parameters and Analysis of microwave filters and periodic structures
	minimum and we like	CO4	Interpret the applications of microwave and millimetric wave circuits
		CO1	Apply the radiation concept and Analyze of different antennas
	Antenna Design & Waya	CO2	Analyze the various antenna types and arrays
20EC3092	Antenna Design & Wave Propagation	CO3	Analyze the VSWR and Impedance measurements for different antennas
		CO4	Interpret real-world applications of various antennas.
	Radar Engineering & Navigational Aids	CO1	Apply the basic principles of communications to build a radar system
20EC3093		CO2	Analyze the MTI radars
201503093		CO3	Analyze different radar systems
		CO4	Understand the principles Navigation system
20EC3094	Modern Antennas, Millimeter Waves &	CO1	Understand and analysis of modern antenna design
		CO2	Apply the concepts of mm waves for meteorological applications.
	Applications	CO3	Design and analyze mm wave circuits.
	مريد مريد في مدين مما ومديد	CO4	Analyze the applications of modern antennas and mm wave radar.
	Electronic Warfare, EMI & EMC	CO1	Understand the basic concept of Electronic Warfare
20EC3095		CO2	Intrepret the different Jamming techniques and its methodologies
		CO3	Interpret the concept of design of EMC and



			components
		CO4	Analyse, design and testing of EMI and EMC
DATA CON	MUNICATION		i filia
		CO1	Analyze different statistical models for information theory and coding
20EC4051	Information Theory &	CO2	Analyze differnt coding methodologies for measuremnt of information
2010-031	Coding	CO3	Analysis of various error detection and correction techniques
		CO4	Analysis of various Error detection and correcting using state diagrams
		CO1	Analysis of Spreading Sequences and Multi- user systems
20EC4052	4G Wireless Technologies and	CO2	Analysis of Multi-carrier Communication Systems
	Cellular Communication	CO3	Analysis of Multi-user communciaion systesm
		CO4	Interpet various Advanced cellular communications and allied topics
		CO1	Apply basic concepts of communications to satellite communciation
20EC4053	Satellite Communications	CO2	Apply the spectrum analysis concept and Analyze the Satellite Link Design and budget
		CO3	Analysis of Multiple Access Techniques
		CO4	Analysis of global navigation systems
	11.5	CO1	Apply fundamental laws of optics and Analyse different optical fiber waveguide types
20EC4054	Optical Communication	CO2	Analyze different optical sources, materials and structures
201204034	and Network	CO3	Evaluate different optical network protocols against network performance
		CO4	Apply the network principles and Analyze the different optical networks
		CO1	Apply wireless communication techniques to analyze 5G New Radio
20EC4060	Next Generation Wireless Technologies	CO2	Apply Massive MIMO for 5G and Beyond 5G
20EC4060		CO3	Analysis of Millimeter wave Communications
		CO4	Design and Evaluate Vehicular Communications and other Advanced Topics
20EC4061	TCP/IP & Other Protocol Suite	CO1	Analyse addressing techniques and troubleshooting protocols
		CO2	Design and Analyze DHCP for development of different networks
		CO3	Design and analyze DNS for development of different networks
		CO4	Analyse congestion control protocols with case studies
20EC4062	VoIP Systems & Broad	CO1	Apply the networking knowledge to interpret the legacy technology of classical telephony
	Band Networks	CO2	Analyse different unicast routing protocols



		CO3	Analyse different VoIP protocols and codecs
		CO4	Apply NAT techniques and Analyse the quality of service for networks with SIP protocol
20EC4063	5G Mobile, Wireless	CO1	Evolution of LTE beyond 4G and 5G and analyze the architectures of 5G and IoT for real-time applications
	Technologies & IEEE	CO2	Analysis of radio access technologies for 5G
	802 Standards	CO3	Analysis of multi-hop and multi-carrier systems for 5G
		CO4	Interpret various IEEE standards
		CO1	Apply cloud network basics for network virtualization
20EC4064	Cloud-Computing &	CO2	Analysis software fabric architecture and cloud data center networks and standards
20EC4004	Network Security	CO3	Apply cloud computing techniques for establishment of network and data center security
		CO4	Analysis of various Network Security issues
	ID Making I C. 1	CO1	Apply PSTN fundamendals to analyse IMS architecture
20EC4065	IP Multimedia Sub- System & Emerging Technologies (Cloud,	CO2	Analyse IMS Protocol stacks and IMS operations
	Technologies (Cloud, IOT, NFV, SDN)	CO3	Analyse IMS-PSTN and IMS services for GSM Web-Msg, voice, VoLTE erc
		CO4	Interpret various Emerging Tech. of IMS
BIO-MEDI	CAL INSTRUMENTATIO	N	pro
		CO1	Apply fundamentals of automation in vehicular systems and review their functionalities.
20EC4071	Automated Vehicles &	CO2	Illustrate the safety parameters in designing ar autonomous vehicular system and demonstate the same using design principles.
20EC4071	Avionics	CO3	Apply digital communication technologies in vehicular automation and show their effectiveness in real-time scenarios.
		CO4	Outline the fundamental concepts in avionical and report design functionalities.
20EC4072	Calibrations and Designing Advanced Instruments	CO1	Apply the knowledge of measuring instruments and show their usage in on-field measurements.
		CO2	Analyze the evolving design parameters of measuring instruments and evaluate the changes with respect to upgrading technologies.
		CO3	Apply instrument calibration methods and discover the impact of parameter relationships during the process.
	1	CO4	Analyze the new approaches introduced in the design of instruments and examine various parameters required for improving reliability.
20EC4073	Biological & Cyber- Physical Systems	CO1	Apply the functionality of basic instruments used in cyber-physical systems and report their characteristics across applications.

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Professor & Head

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		CO2	Analyze application fields of cyber-physical systems and demonstrate the process flow maps used in them to extract sustainability.
		CO3	Apply the usefulness of biological models in formulating digital systems and examine their impact on designing learning algorithms.
		CO4	Apply the knowledge of the application pipelines and report the design and performance parameters.
20EC4074		CO1	Illustrate the fundamental processes in the design of electronic measuring instruments and show their usage in sensing signals.
	Electronic Instruments &	CO2	Analyze the procedures followed in enhancing communication between components and report their effectiveness across instruments.
201014	Biomedical Applications	CO3	Analyze the performance of the instrument developed using bio-inspired electronics and discover the relationships.
		CO4	Illustrate the applications of biomedical electronics across multiple domains and compare their design aspects.
		CO1	Apply the foundations of autonomous vehicle technologies and its basic terminologies
20EC3072	Autonomous Vehicles &	CO2	Analyze the essential principles of sensors and actuators used for automotive
20EC3072	Automotive Electronics	CO3	Discover the fundemental principles of automotive electronic control systems
		CO4	Illustrate the case studies on autonomous vehicles and automotive electronics.
20EC3075	Human Machine Interface & Brain Machine Interface	CO1	Interpret the fundamental concepts of Human-Machine Interfaces and analyze their usefulness in interactive system design.
		CO2	Apply the knowledge generated in the development of HCI models and illustrate their design pardigrams.
		CO3	Analyze the brain control interface models and categorize their importance in understanding human performance.
		CO4	Interpret the BCI/HMI application designs and estimate their value in real world machine interactions.

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